



MAERSK

Maersk Pilot Fuel Switch Initiative



**Regulatory Affairs
Technical Organisation**

26 July 2007



Agenda

- Applicability
- Reasons
- Projected Savings
- Statistics & Emission Reductions Achieved
- Fuel Switch – Main Engine Type – Maersk Owned Vessels
- Fuel Switch – Auxiliary Engine Type – Maersk Owned Vessels
- Fuels Carried Onboard
- Fuel Availability
- Crew Training
- Challenges
- Current Emission Reduction Initiatives
- Contact Details



Applicability

- All Maersk vessels calling California
- Main & Auxiliary Engines to be changed over from 'bunker' fuel to LSDO with Sulfur content below 0.2%
- Inbound - 24 NM from Arrival Port for Main Engine and 24NM from California baseline (RCW) for Auxiliary Engines
- In Port
- Outbound – 24 NM from Departure Port for Main Engine and 24NM from California baseline (RCW) for Auxiliary Engines
- Commenced with Sine Maersk on March 31, 2006



Reasons

- Maersk Lines response to the increased pressure to install Cold Ironing
- Immediate emission reductions for the Ports of Los Angeles & Oakland
- Mobile solution, rapid implementation
- No expensive shore infrastructure required
- Does not shift emissions to other power sources
- Part of Maersk's ongoing evaluation of initiatives for environmentally responsible operation



Projected Savings

- 400 Tons vessel-related emissions annually
- 92 % reduction in Sox
- 73 % reduction in PM
- 10 % reduction in NOx



Statistics - Emission Reductions Achieved

- Number of vessels involved
 - 78 – From April 02, 2006 to May 04, 2007
- Number of fuel switchings carried out
 - 298 – From April 02, 2006 to April 14, 2007 - This number increases continually
- Aggregate consumption of LSDO per switch
 - 23.9 MT – Total figure for both Main & Auxiliary Engine
 - Data from April 02, 2006 to April 14, 2007
- Reductions Achieved as compared to burning Residual Fuels
 - Total Emissions: Around 800 TPY
 - PM: 87%
 - SOx: 95%
 - Nox: 12% (includes use of Lo NOx mode in Aux Engines)
- Data supplied by Environ



MAERSK

PAGE 7

Maersk Pilot Fuel Switch Initiative

Fuel Switch – Main Engine – Maersk Owned Vessels

- MAN B&W
 - 12K90MC
 - 10K90MC-C

- Sulzer Wartsila
 - 12RTA96C
 - 12RT-flex96C
 - 9RTA84C



Fuel Switch – Auxiliary Engines – Maersk Owned Vessels

- MAN B&W
 - Holeby 7L32/40
 - Holeby 8L28/32
 - Hyundai 8L27/38

- Sulzer Wartsila
 - 6R32E

- Daihatsu
 - 6DK-32

- MAK Caterpillar
 - 6M32C



Fuels Carried Onboard

- Residual Fuels
 - RMH 380 / 700
 - RMK 380 / 700

- Distillate Fuels
 - DMX – for Emergency Generator & Lifeboat Engines
 - DMA
 - DMB

- Vessels equipped with separate service tanks for Residual and Distillate fuels
 - Minimising incompatibility problems



LSDO Availability

- Handled By Maersk Bunker
- USWC
 - Mainly Los Angeles & Oakland
 - No Problems in sourcing
 - Good Quality – Inland Distillate
 - Main Supplier – Chemoil – Approx. 80% Volume – Price Driven
 - Average Stem 200 MT
- Far East
 - Japan – Available – Expensive
 - Singapore / Hongkong – Difficult to source
- Europe
 - Rotterdam – Difficult to source – Expensive when available



Crew Training

- Crew advised to follow change over procedure as per engine manufacturer instructions
- No special training provided
- Change over considered 'Normal Engineering Practice'



Challenges

- No problems encountered to date on vessels with regards to change over
- Engines are only running on LSDO for short periods of time
- In case of longer running, manufacturers suggest change over of Cylinder lubrication oil with lower Base Number



Current Emission Reduction Initiatives

- Slide valves
 - MAN main engines
 - Improves the combustion process
 - Reduces visible smoke and PM
 - Less maintenance
 - (less fuel oil consumption/CO2 emission)
- SIP cylinder lubrication system
 - Reduces cylinder oil consumption
 - Reduces PM emission
- Waste Heat Recovery system
 - 10% more mechanical energy output
 - Large and complex installation
 - 10% reduction in all emissions; SOx, PM, NOx & CO2
 - Hot exhaust gas -> steam -> electricity -> electric motors



Current Emission Reduction Initiatives

- Electronically controlled injection in engines
 - Improved combustion in low-load condition
 - No visible smoke – less PM emission
 - Less fuel oil consumption due to better combustion

- Voyage Efficiency System
 - Sharing of sea current data between ships
 - Voyage optimization based on input from MET services, sea current and other sources
 - Less fuel oil consumption due to less distance travelled at high speed

- Maersk Ship Performance System
 - Monitoring of propeller efficiency
 - Monitoring of hull efficiency
 - Optimization of hull and propeller cleaning intervals
 - Monitoring of trim optimization
 - Monitoring of engine performance



Current Emission Reduction Initiatives

- Selective Catalytic Reduction system
 - Test installation on one aux. engine in one ship
 - Monitored with regard to efficiency in port areas / low load situations
 - Mixed results in combination with low-sulphur distillate operation

- Emission & Energy Saving Project
 - Identification of areas where fuel can be saved by optimization of processes
 - Significant savings obtained by monitoring buffer time build up during transit



MAERSK

Contact Information

Jai K. Alimchandani
Manager, Regulatory Affairs
Technical Organisation
A.P. Moller – Maersk
50 Esplanaden
DK 1098 Copenhagen
Denmark

jai.alimchandani@maersk.com

+1 310 525 9454
+45 2361 3919